NRC FORM 366 (7-2001)	U.S. NUCLEAR REGULATORY COMMISSION	APPROVED BY OMB NO. 3150-0104 EXPIRES 7-31-2004

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
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4. TITLE

Reactor Trip Due to Momentary Grid Undervoltage

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
08	15	2002	2002	- 003 -	00	10	9	2002	FACILITY NAME	DOCKET NUMBER

9. OPERATING MODE	1
10. POWER LEVEL	100

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)

20 2201(b)		20.2203(a)(3)(ii)		50.73(a)(2)(ii)(B)	50.73(a)(2)(ix)(A)
20 2201(d)		20.2203(a)(4)		50.73(a)(2)(iii)	50.73(a)(2)(x)
20.2203(a)(1)		50.36(c)(1)(i)(A)	X	50.73(a)(2)(iv)(A)	73.71(a)(4)
20.2203(a)(2)(i)		50.36(c)(1)(ii)(A)		50.73(a)(2)(v)(A)	73.71(a)(5)
20.2203(a)(2)(ii)		50.36(c)(2)		50.73(a)(2)(v)(B)	OTHER Specify in Abstract below or in NRC Form 366A
20.2203(a)(2)(iii)		50.46(a)(3)(ii)		50.73(a)(2)(v)(C)	
20 2203(a)(2)(iv)		50.73(a)(2)(i)(A)		50.73(a)(2)(v)(D)	
20.2203(a)(2)(v)		50.73(a)(2)(i)(B)		50.73(a)(2)(vii)	
20.2203(a)(2)(vi)		50.73(a)(2)(i)(C)		50.73(a)(2)(viii)(A)	
20.2203(a)(3)(i)		50.73(a)(2)(ii)(A)		50.73(a)(2)(viii)(B)	

12. LICENSEE CONTACT FOR THIS LER

NAME	TELEPHONE NUMBER (Include Area Code)
Rick Garner – Lead Engineering Technical Support Specialist	(919) 362-2033

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX		CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX

14. SUPPLEMENTAL REPORT EXPECTED			15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE)	X	NO				

16. ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

At 21:26 on 8/15/02 the Harris Plant tripped from Mode 1 and approximately 100% power due to Reactor Coolant Pump (RCP) momentary undervoltage (UV) on two out of three RCPs. The under voltage relays associated with the "B" and "C" RCPs actuated simultaneously making up the required reactor protection logic to initiate a reactor trip as designed. An Auxiliary Feedwater System automatic start also occurred during this event due to low steam generator level resulting from the plant transient. The offsite power supply to Harris Plant and the onsite power distribution systems remained energized throughout the event.

Cause: The cause of the reactor trip was the momentary grid undervoltage condition. The cause of the undervoltage condition was a grid transient generated when a faulted transformer was loaded onto a 230 KV transmission line in Raleigh, NC, approximately 20 miles from the Harris Plant.

Corrective Actions: The Carolina Power & Light Transmission Department evaluated the event and developed an action plan to decrease the probability of a similar grid event. The Harris Plant will monitor actions by the Transmission Department. No specific actions will be taken for the Harris Plant itself based on equipment and personnel performing in accordance with expectations.

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17. NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)*

I. DESCRIPTION OF EVENT

SUMMARY

At 21:26 on 8/15/02 the Harris Plant tripped from Mode 1 at approximately 100% power due to Reactor Coolant Pump (RCP) undervoltage (UV) on two out of three RCPs. The UV relays associated with the "B" and "C" RCPs actuated simultaneously making up the required reactor protection logic to initiate a reactor trip as designed. The cause of the UV condition was a significant, short duration, grid disturbance generated when a transformer that developed a fault was energized to a 230 KV bus in Raleigh, approximately 20 miles from the Harris Plant.

The unit trip actuated as designed based on the RCP UV Relay sensing the grid voltage degradation. The grid disturbance occurred on the 230 KV transmission system resulting in a low voltage condition for approximately 0.6 second, which satisfied the criteria for initiation of the reactor trip. Since the UV condition was sensed on more than one RCP, the reactor protection logic initiated a reactor trip. Safety and non-safety equipment responded as required. Throughout the transient the electrical buses remained energized and the Reactor Coolant Pumps continued to operate normally. With no loss of bus power, the Emergency Diesel Generators remained in standby and were not required to operate.

No structures, systems, or components were inoperable at the start of this event that contributed to this event. During the transient, an automatic start of both A and B trains' Motor Driven Auxiliary Feedwater Pumps occurred as steam generator level went below the actuation setpoint. The low steam generator level was an expected result of the plant transient conditions related to the trip and the automatic start occurred as expected for this condition.

II. CAUSE OF EVENT

The cause of the reactor trip was the grid UV condition, which actuated two Reactor Coolant Pump bus undervoltage reactor protection relay circuits. The cause of the UV condition was a significant grid disturbance generated when a transformer that developed a fault was energized to a 230 KV transmission line at the Method Substation in Raleigh, NC, approximately 20 miles from the Harris Plant. The "A", "B", and "C" RCP UV relays actuated as designed at approximately 5148 V with a 0.5 second time delay. UV targets dropped on the Non Nuclear Safety (NNS) and Safety buses but the buses did not trip (4800 V, 1.0 second time delay) because the disturbance produced a deep short lived voltage drop that was not in place long enough to trip the buses (the transient was less than one second).

The Carolina Power & Light (CP&L) Transmission Department performed a review of this event and identified several areas where improvements could be made based on the following causal factors:

- Equipment configuration during the recovery from storm damage did not provide the primary protection system for the fault that occurred when power was restored to a transformer. The secondary protection system provided the line protection but not before the grid disturbance was felt by the Harris Plant UV relays for the Reactor Coolant Pumps.
- Equipment not designed for use as current interruption devices was used to test the transformer being returned to service.
- An incomplete assessment of risk to grid stability led to an incorrect decision to test the transformer bank. Transmission Maintenance does not have a documented method for how to determine the physical health of a transformer after lockout and the signs associated with the various failure modes for the transformer. The decision was made to test the autotransformer without sufficient information about why it tripped. A more complete and formal event analysis would have led Transmission Maintenance and System Operations to solicit for more information before determining to test the transformer.
- The normal method of testing the 230/115 KV transformer was not available during this event. The instructions do not address alternate methods of testing transformers. They also do not indicate whether or not it is acceptable to test a transformer from the primary side, and what if any are the dangers/risks in such an evolution.

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III. SAFETY SIGNIFICANCE

This event was potentially safety significant because the plant probabilistic safety assessment (PSA) shows that Non-Emergency Diesel Generator AC Power systems (offsite power) is the third most safety significant system at the plant in terms of impact to core damage frequency. In addition, Loss of Offsite Power is the second highest initiating event type in terms of contribution to core damage frequency. However, this event was a grid disturbance that was cleared by backup fault protection prior to the loss of any safety bus. Loss of off site power safeguards actuations, which include diesel start and sequencing of plant safety loads were not initiated by this event. An Auxiliary Feedwater Actuation occurred as designed in response to low steam generator water level that occurred following the reactor trip. During the plant transient following the reactor trip, primary and secondary control systems performed as designed to stabilize the plant at no-load conditions. The response of the plant and the transmission system was bounded by the analysis contained in the FSAR and plant design bases.

IV. CORRECTIVE ACTIONS

This event was caused by an external condition. The plant responded appropriately to the external condition. Therefore, no internal corrective actions will be taken by the Harris Plant. The Transmission Department performed a revision to their operating procedures so that testing of transmission to transmission transformer banks is performed using circuit breakers that keep the primary relay protection in service. Harris will monitor the additional actions planned by the Transmission Department and the System Planning and Operations Department, which include:

1. Development and implementation of operating procedure(s) that prevent testing transformers with motor operated air break switched following a lockout event.
2. Revising standard substation operating procedures to include acceptable and alternate methods for testing and energizing
3. Training system operators on the proper operation of transformers
4. Revising Dispatcher Technical Reference Manuals (DTRM) to specifically address when it is advisable to test a transformer bank
5. Completion of a procedure or guideline for maintenance to properly assess if it is advisable to energize a transformer
6. Development of a training module to address the risk mitigation of the transmission grid
7. Development of a knowledge based notification process for risk assessment to assure that the appropriate personnel are involved in the risk assessment.

These actions are scheduled to be completed by January 15, 2003.

V. PREVIOUS SIMILAR EVENTS

INPO SOER 99-1, Loss of Grid, provides a detailed roll up of various industry and international events where electrical disturbances on the grid resulted in challenges to nuclear safety and loss of generation similar to the events experienced at Harris on 8/15/02..

Loss or degradation of electrical grid is one of the most safety-significant events that can occur at nuclear power stations. Plant probabilistic safety assessment (PSA) results at many plants clearly indicate that loss of offsite power – loss of grid – is one of the largest contributors to estimated core damage frequency. Since January 1997 thru 1999, more than 25 events involving loss or degraded grid conditions have occurred at WANO member plants.

The focus of this WANO / INPO SOER is twofold. First, it is intended to analyze recent events involving loss of grid to determine how members can reduce the potential of occurrence. However, recognizing that many of the loss of grid events are beyond the control of the nuclear power plant operator, a second purpose of the SOER is to summarize ways that plants can better prepare to respond once grid loss or degradation is imminent or occurs. (Continued)

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V. PREVIOUS SIMILAR EVENTS (continued)

At Sequoyah on December 31, 1992 at 9:48 p.m., Units 1 and 2 automatically scrammed from 100 percent power on a momentary reactor coolant pump bus undervoltage condition. Off-site power was not lost. The undervoltage was caused by an internal ground fault in a new power circuit breaker being placed into service in their 500-KV switchyard. The new power circuit breaker protects the transformer between the 500KV switchyard of Unit 1 and the 161-KV switchyard of Unit 2.

At 0950 on 03/03/00, with Unit 1 in a refueling outage, the Brunswick Plant declared an unusual event due to a loss of offsite power to 4 KV Emergency Buses E-1 and E-2 due to a mispositioned switch during relay testing. All four emergency diesel generators (two for each unit) started; both Unit 1 EDGS are in operation powering buses E-1 and E-2. Shutdown cooling was temporarily lost. Unit 2, was unaffected by this event.

VI. COMMITMENTS

The action committed to by CP&L in this document is identified below. Any other actions discussed in this submittal represent intended or planned actions by CP&L. They are described for the NRC's information and are not regulatory commitments. Please notify the Supervisor – Licensing/Regulatory Programs at HNP of any questions regarding this document or any associated regulatory commitments.

- The Harris Plant will monitor the actions performed by the CP&L Transmission Department and the System Planning and Operations Department associated with this event.